CLAIMS

1. In a smoke detector with a smoke detection circuit, an alarm actuatable by the detection circuit and a D.C. power supply with an A.C. input terminal for receiving A.C. power and a D.C. output terminal on which it normally supplies output D.C. power to the detection circuit and alarm whenever it, in turn, is receiving A.C. input power and a back-up battery to provide D.C. power to the detection circuit and the alarm in the event of loss of output D.C. power from the D.C. power supply, the improvement being a supervision circuit for the back-up battery, comprising:

a) means for checking the power capacity of the back-up battery by loading the battery including:

i) a test load switch,

ii) means for applying a preselected test load to the battery when the test load switch is actuated, and

iii) means for comparing the voltage of the battery to a preselected minimum voltage corresponding to a preselected minimum power capacity when the test load switch is actuated and the battery is test loaded;

b) means for actuating the test load switch;

c) means for switchably disconnecting the D.C. power supply during battery test; and

d) means responsive to said power checking means for providing a low battery power indication in response to the battery power capacity being less than said preselected power capacity.

2. The smoke detector of claim 1 in which said test load switch is an electronic switch, and the test load switch actuating means includes means for automatically and periodically actuating said test load switch for a preselected, relatively short duration during each of a plurality of successive test cycles.

3. The smoke detector of claim 2 in which the time between periods of actuation is in the order forty seconds.

4. The smoke detector of claim ~~3~~ 2 or ~~4~~ in which said preselected duration of actuation is on the order of 10 milliseconds.

5. The smoke detector of claim 1 or 2 in which said means for electrically disconnecting the output of the D.C. power supply comprises an electronic switch.

6. The smoke detector of claim 5 in which said disconnecting means includes:

a power supply control switch interconnected between the D.C. power supply and the comparing means, and

means for opening said power supply control switch in response to actuation of the test load switch.

7. The smoke detector of claim 1 including a diode connected between said battery and the voltage comparator for isolating the back-up battery from the output of the D.C. power supply.

8. The smoke detector of claim 7 in which actuation of the test load switch causes current to be drawn from the battery at a level on the order of ten milliamperes.

9. The smoke detector of claim 1 in which said low battery indicating means include means for actuating said alarm in a mode different from the mode in which it is actuated by said smoke detector in response to detection of smoke.

10. The smoke detector of claim 1 in which

said smoke detection circuit, said voltage comparing means and said low battery indication means are combined in a single integrated circuit package together with an oscillator, and

said switch actuating means includes means responsive to said oscillator for periodically actuating said test load switch.

11. In a smoke detector with a smoke detection circuit, an alarm actuatable by the detection circuit and a D.C. power supply with an A.C. input terminal for receiving A.C. power and a D.C. output terminal on which it normally supplies output D.C. power to the detection circuit and alarm whenever it, in turn, is receiving A.C. input power and a back-up battery to provide D.C. power to the detection circuit and the alarm in the event of loss

of output D.C. power from the D.C. power supply, the improvement being a supervision circuit for the back-up battery, comprising:

means for periodically electrically switchably disconnecting the D.C. power supply for a preselected time period; and

means enabled during said period of disablement of the D.C. power supply for checking the power capacity of the back-up battery by loading the battery.

12. The detection circuit of claim 11 in which said ~~disabling~~ disconnecting means includes

a power supply control switch connecting between the output of the D.C. power supply and the detection circuit, and

means for periodically actuating said power supply control switch to a relatively non-conductive state to electrically disconnect the power supply from the ~~power checking means~~ detection circuit.

13. The detection circuit of claim ~~11~~ 13 in which said battery power capacity checking means includes

another switch enabled in response to the ~~electronic~~ control switch being in a relatively non-conductive state to load said battery, and

means for comparing the voltage of the back-up battery, when loaded, to a preselected minimum voltage.

14. The detection circuit of claim ~~11~~ 13 in which said ~~other~~ another switch is a diode connected between the battery and the D.C. power supply output with a polarity to isolate the battery from the D.C. power

supply when the voltage output level of the D.C. power supply is forced below the battery voltage.

15. In a smoke detector with a smoke detection circuit, an alarm actuatable by the detection circuit and a D.C. power supply with an A.C. input terminal for receiving A.C. power and a D.C. output terminal on which it normally supplies output D.C. power to the detection circuit and alarm whenever it, in turn, is receiving A.C. input power and a back-up battery to provide D.C. power to the detection circuit and the alarm in the event of loss of output D.C. power from the D.C. power supply, the improvement being a supervision circuit for the back-up battery, comprising:

means including a switch connected for disabling said D.C. power supply from providing D.C. output power;

means for electrically connecting the back-up battery through a test load; and

means for comparing the power capacity of said battery to a preselected minimum capacity when it is being electrically connected through said test load.

16. The smoke detector circuit of claim 15 in which the A.C. input of the power supply, and said battery connecting means includes a test load switch for connecting the battery with the test load.

17. The smoke detector of claim 16 including means responsive to actuation of the test load switch to actuate the disabling means.

18. The smoke detector of claim 17 in which said battery connecting means includes the switch of said disabling means and means for connecting the D.C. output of the power supply through said test load when actuated.

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